PRECAST GRAVITY RETAINING WALLS (9-21-10)

1.0 GENERAL

A precast gravity retaining wall consists of unreinforced precast concrete units with a cast-in-place unreinforced concrete footing. Design and construct precast gravity retaining walls based on actual elevations and dimensions in accordance with the contract and accepted submittals. For this provision, "precast gravity wall" refers to a precast gravity retaining wall and "precast units" refer to unreinforced precast concrete units.

2.0 DESIGN SUBMITTAL

Submit 11 hard copies of working drawings and 3 hard copies of design calculations and an electronic copy (PDF on CD or DVD) of each for the precast gravity wall design submittal. Provide the submittal at least 30 calendar days before conducting the precast gravity wall preconstruction meeting. Do not begin precast gravity wall construction until the design submittal is accepted.

The Retaining Wall Plans show a plan view, typical sections, details, notes and an elevation or profile view (wall envelope) for each precast gravity wall. Before beginning precast gravity wall design, survey existing ground elevations shown on the plans and other elevations in the vicinity of precast gravity walls as needed. Based on these elevations, finished grades and actual precast gravity wall dimensions and details, submit revised wall envelopes for review and acceptance. Use the accepted revised wall envelopes for design.

Design precast gravity walls in accordance with the plans and Article 11.11 of the *AASHTO LRFD Bridge Design Specifications* unless otherwise required. Also, design precast gravity walls to meet minimum clearances and maximum wall batter shown on the plans. Do not locate precast units or footings beyond right-of-way or easement lines.

When a note on plans requires a live load (traffic) surcharge, use a surcharge load of 250 psf (12 kPa) with a load factor of 1.75 in accordance with Article 3.11.6.2 of the AASHTO LRFD specifications. For steel beam guardrail with 8' (2.4 m) posts above precast gravity walls, design walls for an additional horizontal load of 300 lbs/linear ft (4.38 kN/linear m) of wall. For concrete barrier rails with moment slabs above precast gravity walls, design walls for an additional horizontal load of 500 lbs/linear ft (7.30 kN/linear m) of wall. Apply additional loads to the back of precast gravity walls at a depth of 2 ft (0.6m) below grade elevation.

Use 12 inch (300 mm) thick cast-in-place unreinforced concrete footings beneath precast units that are continuous at steps and extend a minimum of 6" (150 mm) in front of and behind the bottom row of precast units. Unless required otherwise on the plans, embed bottom of footings a minimum of 2 ft (0.6 m) below where finished grade intersects the front face of precast gravity walls.

Fill precast unit core spaces with no. 57 stone, if applicable. Assume a unit weight of 100 pcf (15.7 kN/m^3) for stone. Also, fill between and behind precast units with no. 57 stone

for a horizontal distance of at least 18" (450 mm) and make stone continuous in all directions. When adjacent precast units are different sizes, it may be necessary to fill behind units with more than 18" (450 mm) of no. 57 stone to make stone continuous. Place separation fabric between no. 57 stone and backfill or natural ground. Also, place separation fabric between no. 57 stone and overlying fill or pavement section with the exception of when concrete pavement is placed directly on the stone. When a note on plans requires a drain pipe, use a 4" (100 mm) dia. continuous perforated pipe in the no. 57 stone behind the bottom row of precast units.

At the Contractor's option, use cap or top precast units at top of walls unless there is a back slope or barrier above precast gravity walls as shown on the plans. For precast gravity walls with back slopes, use top precast units only and extend top of walls a minimum of 4" (100 mm) above where finished grade intersects the back of walls. If necessary, adjust paved ditch width or back slope for varying grade elevations along top of walls and make ditches continuous with cast-in-place concrete ditches when top of wall steps down. When barriers are required above precast gravity walls, do not use cap precast units and use concrete barrier rails with moment slabs as shown on the plans. When single faced precast concrete barriers are required in front of precast gravity walls, fill between barriers and wall faces with no. 57 stone.

Submit working drawings and design calculations for review and acceptance in accordance with Article 105-2 of the *Standard Specifications*. Submit working drawings showing plan views, wall profiles with required resistances, typical sections, separation fabric locations and details of footings, precast units, etc. If necessary, include details on working drawings for cast-in-place concrete ditches, concrete barrier rails with moment slabs and obstructions extending through walls or interfering with concrete barrier rails and moment slabs. Submit design calculations for each wall section with different surcharge loads, geometry or material parameters. When using a software program for design, provide a hand calculation verifying the analysis of the tallest wall section. Have precast gravity walls designed, detailed and sealed by a Professional Engineer registered in North Carolina.

3.0 MATERIALS

A. Footings

Provide cast-in-place unreinforced concrete footings meeting the requirements of Section 1000 of the *Standard Specifications*. Use Class A Concrete in accordance with Article 1000-4 of the *Standard Specifications*.

B. Precast Concrete Units

Provide precast concrete units meeting the requirements of Sections 1000 and 1077 of the *Standard Specifications*. A minimum compressive strength of 4000 psi (27.6 MPa) at 28 days is required. For testing precast units for compressive strength, 4 cylinders are required per 40 yd^3 (31 m^3) of concrete or a single day's production, whichever is less.

With the exception of front faces of precast units, provide a final finish in accordance with Article 1077-11 of the *Standard Specifications*. Unless required otherwise on the plans, provide precast units with a vertical rock like face and a concrete gray color with no tints, dyes, pigments or stains. Before beginning precast unit production, obtain approval of the precast unit type, face and color proposed for the project.

C. No. 57 Stone

Use standard size no. 57 stone meeting the requirements of Class VI Select Material in accordance with Section 1016 of the *Standard Specifications*.

D. Wall Drainage Systems

Wall drainage systems consist of perforated polyvinyl chloride (PVC) plastic pipes and outlet components. Use pipe and outlet materials meeting the requirements of subsurface drainage materials in accordance with Section 1044 of the *Standard Specifications*.

E. Separation Fabrics

Use separation fabrics meeting the requirements of Type 2 Engineering Fabric in accordance with Section 1056 of the *Standard Specifications*.

4.0 PRECONSTRUCTION MEETING

Before starting precast gravity wall construction, conduct a preconstruction meeting to discuss the construction and inspection of the precast gravity walls. Schedule this meeting after all precast gravity wall submittals have been accepted. The Resident or Bridge Maintenance Engineer, Bridge Construction Engineer, Geotechnical Operations Engineer, Contractor and Precast Gravity Wall Installer Superintendent will attend this preconstruction meeting.

5.0 CONSTRUCTION METHODS

Control drainage during construction in the vicinity of precast gravity walls. Direct run off away from precast gravity walls, no. 57 stone and backfill. Contain and maintain stone and backfill and protect material from erosion.

Perform all necessary clearing and grubbing in accordance with Section 200 of the *Standard Specifications*. Excavate as necessary for precast gravity walls in accordance with the accepted submittals. If applicable and at the Contractor's option, "temporary shoring for wall construction" may be used in lieu of temporary slopes to construct precast gravity walls. Temporary shoring for wall construction is defined as temporary shoring not shown on the plans or required by the Engineer including shoring for OSHA reasons or the Contractor's convenience.

Notify the Engineer when foundation excavation is complete. Do not place concrete for footings until obtaining approval of the excavation depth and foundation material.

Construct cast-in-place concrete footings at elevations and with dimensions shown in the accepted submittals and in accordance with Section 420 of the *Standard Specifications*. Cure footings a minimum of 24 hours before placing precast units.

Place precast units with no negative wall batter (wall face leaning forward) such that the final position is as shown in the accepted submittals. Stagger vertical precast unit joints to create a running bond when possible unless shown otherwise in the accepted submittals. Place precast units with a maximum joint width of ½ inch (13 mm). Construct precast gravity walls with a horizontal tolerance of ¾ inch (19 mm) when measured with a 10 ft (3 m) straight edge and a vertical tolerance within 2 degrees of the wall batter shown in the accepted submittals.

If a drain pipe is required, construct wall drainage systems as shown in the accepted submittals and in accordance with Section 815 of the *Standard Specifications*. Provide drain pipes with positive drainage towards outlets. Place no. 57 stone between and behind precast units in 8 to 10 inch (200 to 250 mm) thick lifts. Compact stone with hand operated compaction equipment. Overlap separation fabric a minimum of 18" (450 mm) at seams. Backfill for wall construction behind no. 57 stone in accordance with Article 410-8 of the *Standard Specifications*. Set cap precast units with a ½ to 1-½ inch (13 to 38 mm) overhang.

6.0 MEASUREMENT AND PAYMENT

Precast Gravity Retaining Walls will be measured and paid for in square feet (meters). Precast gravity walls will be measured as the exposed face area with the wall height equal to the difference between the top and bottom of wall elevation. The top of wall elevation is defined as the top of cap/top precast units. The bottom of wall elevation is as shown on the plans and no payment will be made for portions of precast gravity walls below bottom of wall elevations.

The contract unit price for *Precast Gravity Retaining Walls* will be full compensation for providing design, submittals, labor, tools, equipment and precast gravity wall materials, excavating, backfilling, hauling and removing excavated materials and providing footings, precast units, no. 57 stone, wall drainage systems, fabrics and any incidentals necessary to design and construct precast gravity walls in accordance with this provision.

No separate payment will be made for temporary shoring for wall construction. Temporary shoring for wall construction will be considered incidental to the contract unit price for *Precast Gravity Retaining Walls*.

The contract unit price for *Precast Gravity Retaining Walls* does not include the cost for fences, handrails, ditches, guardrail and barriers associated with precast gravity walls as payment for these items will be made elsewhere in the contract.

Payment will be made under:

Pay Item	**Pay Unit**